

Preface

The steady advances in computing technology for over a decade have brought about a revolution in the way we use computers in our everyday life. The progress to date has also succeeded in modernizing businesses and solving problems that were previously intractable. The advances in multimedia systems, however, promise an even greater change in the personal usage of computers. The ability to deliver and process audio and video with devices that can reside in a person's home or office will enhance the way we conduct business, obtain education, and entertain ourselves. While the promise of multimedia technology has been evident for quite some time, today we are much wiser about the barriers that have to be overcome for successful deployment of multimedia applications.

Considering how a multimedia application is brought to a user in the office or at home, one realizes that multimedia applications place many requirements and restrictions on the underlying technologies, from databases and file systems to signal processing and networking. Multimedia files are large, and a huge amount of data has to be transported (most often in real time) from remote servers to the end users. Various technologies are taking advantage of the existing wiring infrastructure and have brought us to a point where a substantial amount of data, audio, and video can be delivered to users. The ability to retrieve and process video entails not only real-time requirements but also requirements for storing, managing, and searching huge amounts of data.

In this issue of the *IBM Journal of Research and Development*, we present some of the important ideas in multimedia and major efforts undertaken at IBM. We have collected papers that describe some of the major IBM projects, not only in the laboratories but in the field as well.

The introductory paper, by Flynn and Tetzlaff, describes various terms and basic concepts in multimedia and provides a survey of various types of multimedia applications. The authors also review the technologies and architectures of systems for deploying such applications.

In the next paper, by Dan et al., we take a fresh look at the progress (or lack of it) in multimedia and present a critical editorial perspective. We sketch the history of evolution in multimedia and present the major challenges that have to be addressed for successful deployment of multimedia-based applications.

The paper by Haskin provides an overview of a significant effort on file systems for storage and real-time retrieval of large multimedia files. Tiger Shark addresses the requirements for large-scale multimedia

as well as nonmultimedia applications, such as scientific computing and network servers. The paper describes the implementation of the file system and also presents experience in the use of Tiger Shark in real environments (field trials).

In their paper, Sanuki and Asakawa describe the end-to-end architecture of an operational video-on-demand system deployed in Japan. The system is scalable to a large number of users and delivers video streams encoded in MPEG-2 over an HFC (hybrid fiber-coax) interconnection system.

The paper by Kumar describes a proposal for an alternative architecture for video servers accommodating a large user population. In his approach, the author uses dedicated hardware for video delivery that is directly attached to the network, and the video information is stored in the form of network packets. This results in a server that avoids the processing and I/O bottleneck caused in traditional architectures by the protocol and file-system overheads.

One of the most important problems in multimedia technologies is obtaining information from large databases. The tremendous amount of data required in images and video streams has resulted in databases that are larger than traditional ones by several orders of magnitude. It is imperative to develop methodologies that allow us to "search" such databases on the basis of content information, in a simple, concise, and efficient fashion; this presents significant challenges, when one considers the available technology for databases. The following two papers address exactly this problem in the context of video and images, respectively.

The paper by Bolle et al. describes a framework for viewing and searching video in such databases, while the paper by Castelli et al. describes a framework for searching images by means of some user-specified content description.

The paper by Willebeek-LeMair et al. describes a solution for providing high-quality audio and video to users over low-bit-rate connections. The solution is Web-based and was demonstrated at the 1996 Summer Olympics.

The final paper, by Bisdikian et al., describes a prototype Web-based teleconferencing system that enables collaborative work through audio and data conferences among users with heterogeneous systems. The audio is carried over the telephone network, while the data is carried over the Internet. Therefore, a key feature of this solution is that the clients do not require any special hardware or software.

We are indebted to the authors, who spent a great deal of time to write the papers presented in this issue of the *IBM Journal of Research and Development*. We

are all proud of this issue, which reflects the significant effort of the people in the IBM Corporation to enable multimedia technology for users in business and home environments. They have played an important role in a technology that is expected to significantly influence a wide range of activities.

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